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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : B65D 85/00, H05B 6/64

A1

(11) International Publication Number: WO 91/09791

(43) International Publication Date: 11 July 1991 (11.07.91)

(21) International Application Number: PCT/US90/06889

(22) International Filing Date: 26 November 1990 (26.11.90)

(30) Priority data:
458,924 29 December 1989 (29.12.89) US

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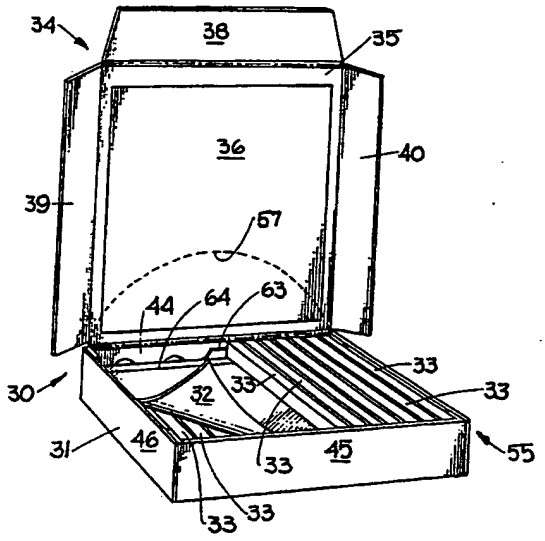
(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).

Published
With international search report.

(54) Title: MICROWAVE FOOD PACKAGE



(57) Abstract

A microwave food package (30) for use in microwave heating a plurality of food pieces (33) disposed in at least two layers in the package which heating is to effect crispening of exterior portions of the food pieces (33) and to brown exterior surface areas of the food pieces (33). The package (30) comprises microwave susceptor means (32, 36) for applying heat generated in the microwave susceptor means (32, 36) to oppositely facing surface areas of each food piece (33) disposed in the package (30). An exemplary package comprises, for instance, an enclosure such as a disposable carton (31), a top microwave susceptor (36), a bottom microwave susceptor, and an intermediate-elevation microwave susceptor (32) between each two adjacent layers of food pieces (33) so that oppositely facing surfaces of each food piece (33) are disposed adjacent portions of the microwave susceptors (32, 36), preferably in snug contacting relation to enable direct conductive heating of the food pieces (33) by the adjacent microwave susceptors (32, 36).

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MICROWAVE FOOD PACKAGE

TECHNICAL FIELD

This invention pertains to microwave food packages which packages are suitable for microwave heating articles such as food pieces disposed therein to effect cooking and/or crispening, and possibly browning of the food pieces. This includes packages which are suitable for warehousing, transporting, and marketing with food pieces disposed therein, as well as packages which are suitable for having food pieces placed therein at the site where the heating and crispening are to occur: e.g., in a consumer's kitchen. Additionally, this includes microwave food packages having features which enable eating from the package: i.e., means for enabling a user to open the package so that it becomes, in effect, a serving receptacle for the food pieces contained therein.

BACKGROUND ART

A microwaveable food package and carton therefore comprising microwave susceptors (i.e., materials which are heated by internally generated heat when subjected to microwave energy) for browning and crisping two sides of food pieces contained therein is disclosed in U. S. Patent 4,590,349, Microwave Cooking Carton For Browning And Crisping Food On Two Sides which patent issued May 20, 1986 to Brown et al. It is specifically directed to browning and crisping two sides of food pieces having non-uniform dimensions; the carton has an internal height exceeding the average vertical height of the food pieces; and it states that the package be inverted during the microwave heating cycle to cause the food pieces to gravitationally contact a final food support panel disposed in the top portion of the carton.

A microwaveable food carton comprising an integral, mid-elevation food supporting panel having a sheet of microwave interactive material placed on one surface is disclosed in U. S. Patent 4,836,383, Microwave Food Carton With Divider Panel which patent issued June 6, 1989 to Gordon et al. Essentially, the

construction of the carton is such that food contained within the carton is elevated above the carton bottom on a false bottom: i.e., the mid-elevation food support panel. Thus, the microwave interactive material on the mid-elevation food support panel causes the support panel to have a hot plate heating effect on the food supported thereon. The function of the microwave interactive sheet is stated to be to brown or crispen the contacted surface of the food product.

Additional U. S. Patents which disclose microwave food packages and browning of foodstuffs packaged therein include: number 4,190,757, Microwave Heating Package and Method which issued February 26, 1980 to Turpin et al; number 4,267,420, Packaged Food Item And Method For Achieving Microwave Browning Thereof which issued May 12, 1981 to Brastad; number 4,594,492, Microwave Package Including A Resiliently Biased Browning Layer which issued June 10, 1986 to Maroszek; and number 4,777,053, Microwave Heating Package which issued October 11, 1988 to Tobelmann et al.

Further disclosures of microwave cartons, packages, and susceptors are included in the following U. S. Patents: numbers 4,641,005 and 4,825,025, both titled Food Receptacle For Microwave Cooking, which issued February 3, 1987 and April 25, 1989, respectively, to Oscar E. Seiferth; and number 4,230,924, Method And Material For Prepackaging Food To Achieve Microwave Browning which issued October 28, 1980; and number 4,864,089, Localized Microwave Radiation Heating which issued September 5, 1989 to Tighe et al. Tighe et al (4,864,089) disclose formation of microwave susceptor areas on suitable substrates by coating or printing a resin binder with conductive and semiconductive particles.

Microwave susceptor technology is discussed further in Microwave Susceptor Use Continues To Be Hot Topic, Paper, Film & Foil Converter, January 1989, pages 62-64, inclusive. Additionally, parfrying technology, which is considered to be ancillary to the present invention, is disclosed in U. S. Patent 4,590,080, Process For Preparing Parfried And Frozen Potato Products which issued May 20, 1986.

DISCLOSURE OF THE INVENTION

A microwave food package is provided, in one aspect of the invention, which comprises an enclosure such as a disposable carton, a plurality of layers of articles such as food pieces, and sufficient microwave susceptor panels that portions of the microwave susceptor panels are disposed adjacent oppositely facing surfaces of each of the food pieces. The package preferably further comprises means for venting the enclosure during microwave heating; and means for opening the enclosure, upon completion of the heating, so that the enclosure is converted into a serving receptacle. The enclosure is preferably sized and configured, relative to the food pieces and layers thereof, to accommodate the layers of food pieces so that there is a snug contacting relationship between the surfaces of the microwave susceptor panels and the adjacent surfaces of the pieces of food; and the enclosure further comprises means for maintaining such a snug contacting relationship while the package is heated in a microwave oven. Preferably, the food pieces are uniformly thick, and have oppositely facing planar surfaces to facilitate the snug contacting relationship, and thus enable direct conductive heating of those surfaces by the microwave susceptors while the package is subjected to microwave energy in a microwave oven for a sufficient period of time. The microwave susceptors are preferably configured to effect sufficient such direct heating that the food pieces give a crisp-exterior eating sensation. A two layer embodiment of the invention comprises a top microwave susceptor panel, a bottom microwave susceptor panel, and an intermediate-elevation microwave susceptor panel; and a three layer embodiment comprises an additional intermediate-elevation microwave susceptor panel. Discrete microwave susceptor panels may be utilized within an enclosure or, alternatively, microwave susceptor material may be disposed on surface areas of integral portions of the enclosure, and preferably covered with a protective material such as a thermoplastic film. Additionally, the two intermediate-elevation microwave susceptor panels of a three layer embodiment may be integrated into a unitary element to facilitate simultaneous removal thereof. In another aspect of the invention, dual means are provided for opening the enclosure whereby the enclosure may assume a cup-like shape or, alternatively, a tray-like receptacle.

BRIEF DESCRIPTIONS OF THE DRAWINGS

While the specification concludes with claims which particularly point out and distinctly claim the subject matter regarded as forming the present invention, it is believed the invention will be better understood from the following description taken in conjunction with the accompanying drawings in which identical facets in the several views are identified by the same designators, and similar facets of the several embodiments are identified by designators having common tens and units digits, and in which:

Figure 1 is a perspective view of a package embodiment of the invention which package comprises a carton having plural layers of uniformly sized and shaped food pieces disposed therein, and having its cover disposed in its open position.

Figure 2 is a perspective view of an empty carton of the type shown in Figure 1.

Figure 3 is a plan view of an intermediate-elevation microwave susceptor panel of the type disposed in the carton shown in Figure 1.

Figure 4 is a frontal perspective view of a package embodiment of the invention after it has been opened.

Figure 5 is a frontal perspective view of the package of Figure 4 after its side walls have been squeezed inward, and its front and rear walls bowed outward to facilitate eating the food pieces disposed in the package.

Figure 6 is a perspective rear view of the package of Figure 5 with an optional handle component of the carton in its erected position.

Figure 7 is a perspective, partially torn away view of an alternate microwave food package embodiment of the invention.

Figure 8 is a perspective view of the package of Figure 7 with two vent flaps in their open positions, and with the package in its preferred disposition for placement in a microwave oven.

Figure 9 is a fragmentary perspective view of the package of Figure 8 after its strap-flap has been raised, and one of its two intermediate-elevation microwave susceptor panels partially removed.

Figure 10 is a perspective view of the package of Figure 8 after it has been repositioned to lie on its bottom panel, and its top

panel portions opened to provide layer-by-layer eating access to the contents of the package.

Figure 11 is a plan view of a carton blank which may be erected to form the carton of the package shown in Figures 7 through 10.

Figure 12 is a plan view of an alternate embodiment, intermediate-elevation microwave susceptor panel.

Figure 13 is a fragmentary cross sectional view of the alternate embodiment, intermediate-elevation microwave susceptor panel of Figure 12.

Figure 14 is a plan view of a unitary, dual intermediate-elevation microwave susceptor panel for use in package embodiments of the invention.

Figure 15 is a perspective view of a package embodiment of the invention which comprises a dual intermediate-elevation microwave susceptor panel of the configuration shown in Figure 14.

Figure 16 is a plan view of a carton blank which may be erected to form a carton having two integral, intermediate-elevation microwave susceptor panels.

Figure 17 is a cross sectional view of a carton formed by erecting a carton blank of the configuration shown in Figure 16.

Figure 18 is a perspective view of a carton formed by erecting a carton blank of the configuration shown in Figure 16, but before it has been filled, and before its integral, intermediate-elevation panels have been folded inward.

Figure 19 is a side elevational, sectional view of the carton shown in Figure 18.

Figure 20 is a sectional view of the carton of Figure 19 after one layer of food pieces has been loaded.

Figure 21 is a sectional view of the carton of Figure 20 after a second layer of food pieces has been loaded, and with an integral, intermediate-elevation, microwave susceptor panel positioned between the two layers.

Figure 22 is a sectional view of the carton of Figure 21 after it has been fully loaded with three layers of food pieces, and with its two integral intermediate-elevation microwave susceptor panels positioned between the layers.

Figure 23 is a sectional view of the loaded carton of Figure 22 after its top has been closed.

Figure 24 is a plan view of an alternate embodiment carton blank which may be erected to form a carton having two integral, intermediate-elevation, microwave susceptor panels.

Figure 25 is a cross sectional view of a carton formed by erecting a carton blank of the configuration shown in Figure 24.

Figure 26 is a perspective view of an opened package comprising a carton blank of the configuration shown in Figure 24; and with the top layer of food pieces removed, and portions of the top intermediate-elevation susceptor panel folded back to provide top access to the intermediate layer of food pieces.

DETAILED DESCRIPTION OF THE INVENTION

A microwave food package 30 which is an embodiment of the present invention is shown in Figure 1, prior to its being closed, to comprise a carton 31, an intermediate-elevation microwave susceptor panel 32 having a corner turned up and back, and a plurality of elongate food pieces 33 arranged in side-by-side, laterally spaced, substantially parallel relation in plural layers. Additionally, as shown in Figure 1, carton 31 comprises a cover 34 which comprises a top wall 35 having a top microwave susceptor panel 36 secured thereto: for example as with an adhesive. In a preferred embodiment of package 30, there are three layers of food pieces 33 albeit only two layers are visible in Figure 1; and two intermediate-elevation microwave susceptor panels 32, only one of which is visible in Figure 1. One intermediate-elevation, microwave susceptor panel 32 is disposed between the bottom layer and the intermediate layer of food pieces 33; and the second intermediate-elevation microwave susceptor panel 32, visible in Figure 1, is disposed between the intermediate layer and the top layer of food pieces 33. Additionally, package 30 preferably comprises a bottom microwave susceptor panel (not shown in Figure 1) disposed subjacent the bottom layer of food pieces 33. Preferably the bottom microwave susceptor panel is secured to the bottom wall of carton 31 or made an integral portion thereof. The terms top, bottom, side, upward, downward and the like are relative terms, and are not intended to connote any particular spatial

orientation. Parenthetically, albeit the food pieces 33 are shown in Figure 1 to be laterally spaced, it is not intended to thereby limit the present invention to embodiments wherein the articles are laterally spaced.

Briefly, the invention provides a microwave food package wherein, for instance, plural layers of food pieces having oppositely facing planar surfaces are so disposed with respect to microwave susceptor elements of the package that two oppositely disposed planar surfaces of each food piece are in snug contacting relation with microwave susceptor elements. This enables direct conductive heating by the microwave susceptors to effect, for example, crispening and possibly browning of outer portions of the food pieces when the package is heated within a microwave oven. The food pieces may, for example, be uniformly sized and shaped potato strips which have preferably been parfried prior to packaging. Such potato strips, whether parfried or not, are commonly and hereinafter referred to as french fries albeit they are not deep fat fried to a doneness state.

Cover 34 of carton 31, Figure 2, comprises top wall 35, top microwave susceptor panel 36, front flap 38, and side flaps 39 and 40; and bottom wall 43, back wall 44, front wall 45, and side walls 46 and 47. Additionally, back wall 44 comprises tabs 51 and 52, and front wall 45 comprises tabs 53 and 54. Preferably, tabs 51-54 are adhesively secured to the side walls of the carton to form an open, box-type bottom 55 of carton 31 as shown. Carton 31 further comprises a bottom microwave susceptor panel 56 which may be secured to bottom wall 43 by, for example, adhesive. It is, however, not intended to thereby limit the present invention to such carton constructions having discrete microwave susceptor panels; whether attached or not. That is, microwave susceptor material can be directly applied to integral panels of a carton blank; or discrete microwave susceptors can be inserted in carton 31. After carton 31 is filled, cover 34 is closed, and flaps 38-40 are secured to walls 45-47, respectively.

Still referring to Figure 2, carton 31 is provided with means for opening it which means are shown in Figure 2 to comprise a line of weakening 57 in cover 34. Such a line of of weakening may, for example, be a line of perforations or spaced cuts in cover 34 which

enable opening of the package/carton by rupturing the line of weakening. Alternatively, a zip strip or other contemporary carton opening means may be provided. A zip strip or tear strip may be configured to provide a hinged opening feature similar to the hinged configuration of Figure 4; or, alternatively, a zip strip or tear strip may be configured to enable separating a removable portion of the carton from a remainder portion: i.e., a serving receptacle portion.

Carton 31, Figure 2, further comprises means for being vented to enable the escape of volatiles and the like when a package comprising a closed carton 31 is heated in a microwave oven. In carton 31, Figure 2, the means for venting is a plurality of vent holes 58 in back wall 44. Means for sealing the vent holes 58 prior to heating the package may comprise a strip of peelable tape, not shown. Alternatively, of course, a tear strip may be incorporated in back wall 44, or another portion of carton 31 to provide the venting means. Still another alternative is to overwrap the package. Of course, for overwrapped packages, the overwrapping must be removed prior to placement in a microwave oven. It is believed that such overwrapped packages do not need additional means for sealing the vent holes.

Figure 3 is a plan view of a preferred embodiment of an exemplary, discrete intermediate-elevation microwave susceptor panel 32. Susceptor panel 32 is a laminate comprising a paper substrate 60, and a thermoplastic film 61 bonded thereto which film is provided with a coating 62 of microwave interactive material such as metal, and which coating is sufficiently thin that it is heated to a sufficiently high temperature, when subjected to microwave energy, to effect food heating, crispening and browning which are referred to herein. Preferably, susceptor panel 32 is configured to fit the interior dimensions of carton 31, and to have a pull-tab 63. Preferably, the coated surface of the thermoplastic film is bonded to the paper substrate, but is configured to not cover pull-tab 62 so that pull-tab 62 is not directly heated by microwave energy. As oriented in Figure 3, the top edge of film 61 is designated 64. Such coating and laminating may be done in accordance with U. S. Patent 4,825,025 which is hereby incorporated by reference. Additionally,

exemplary laminates of this type, which have been used in embodiments of the present invention, were procured from the Metalizing Division of Leigh-Mardon PTY, LTD, 9 MeLissa St., Auburn, New South Wales 2144, and identified by them as VF.2172.75.A. This laminate comprises a base of Microlamtm 44 having a vapor deposited coating of metal which is believed to be aluminum; and the laminate has a basis weight of about sixty-two (62) grams per square meter, and a nominal thickness of about seven-hundredths of a millimeter (0.07 mm).

Package 30, Figure 1, is made by placing a first layer of food pieces in carton 31, then positioning a first intermediate-elevation microwave susceptor panel to cover the first layer; then placing a second layer of food pieces on top of the first intermediate-elevation microwave susceptor panel; then placing a second intermediate-elevation microwave susceptor panel to cover the second layer; then placing a third layer of food pieces 33 on top of the second intermediate-elevation microwave susceptor panel; and then closing the cover and securing flaps 38-40 to walls 45-47, respectively. The package may further comprise an overwrap, not shown, to ensure sealing and/or to provide surface areas for instructions, product identification, and other package indicia as desired.

Package 30 is preferably unopened, and oriented in the position shown in Figure 4 when placed in a microwave oven, and with vent holes 58 open. This orientation is preferred for heating because it positions the vent holes 58 to face upward. Of course, for packages comprising overwraps, it is also preferred that the overwrap be removed prior to placement in a microwave oven.

Package 30, Figure 4, has been opened, and is disposed in its preferred eating orientation: i.e., with its back wall 44 extending upward, and its top wall 35 facing forward. As shown, the top wall 35 has been subdivided into two portions 35t and 35b having edges 57t and 57b, respectively. Such opening of package 30 is effected by rupturing the top wall 35 of carton 31, Figure 2, and the top susceptor panel 36 along line of weakening 57 as discussed above, and lifting the back wall 44 and the top wall portion 35t to the position shown in Figure 4. The portion of the top microwave susceptor panel 36, Figure 2, which is attached to top wall portion 35t is designated

panel portion 36t in Figure 4. It is, of course, preferred that heating be completed prior to opening the package else the snug relationship between the microwave susceptor panels and the food pieces be compromised or vitiated.

Still referring to Figure 4, opened package 30 has three layers of food pieces 33 which layers are separated by intermediate-elevation microwave susceptor panels, only the pull-tabs 63 of which are visible. Additionally, score lines 67 and 68 are shown in wall portion 35b. Score lines 67 and 68, and additional score lines in the oppositely facing wall of the carton, enable converting carton 31 into a cup-shape receptacle by squeezing the sides of the package towards each other. The cup-shape carton achieved by such squeezing is shown in Figure 5.

Figure 5 is a front perspective view of the opened package 30 of Figure 4 after it has been squeezed as described above to effect the shape depicted in Figure 5. Also, the intermediate-elevation susceptor panels have been removed as is manifest by the absence of pull-tabs 63 from Figure 5, while pull-tabs 63 are shown in Figure 4.

Figure 6 is a rear perspective view of the opened package 30 of Figure 5. In addition to the features of carton 31 described above, this view shows score lines 71 and 72. Score lines 71 and 72 extend from the lower corners of bottom wall 43 of the package 30 to the center of the score line 73 which demarks wall 43 from wall 44. Score lines 71 and 72 act, in conjunction with score lines 67 and 68, Figure 5, to enable the squeeze conversion of carton 31 from the parallelopipedal shape of Figure 4 to the cup shape of Figure 5 as discussed above. Additionally, an optional handle 75 is shown in Figure 6 to be attached to wall 43. Handle 75 comprises a central panel 76 which is attached to wall 43; two hinged panels 77 and 78; and lock tab 79 which is a portion of hinged panel 78, and which has a distal portion which extends through an aperture 80 in hinged panel 77 to lock the hinged panels 77 and 78 together. Such a handle is preferably disposed in a flat state until package 30 is prepared for placement in a microwave oven. At that time the handle is erected to the configuration shown in Figure 5. Preferably handle 75 does not comprise matter which is substantially reactive with microwave energy

so that it remains cool while the food pieces within package 30 are heated.

EXAMPLE 1

A package of the configuration shown and described above in conjunction with discussing Figures 1 through 6 was prepared as follows. The carton 31 was about three-and-one-half (3 and 1/2) inches (about 8.9 cm) from front to back, about four (4) inches (about 10.2 cm) wide, and about seven-eights (7/8) inches (about 2.2 cm) high. Carton 31 was made from twenty-four (24) point cartonboard. The venting means comprised five (5) circular apertures 58 of one-quarter (1/4) inch (about 6.4 mm) diameter in wall 44. The microwave susceptor panels 32, 36 and 56 were of the laminated type described above which comprise a paper substrate, and a thermoplastic film lamina having a coating of vapor deposited metal (believed to be aluminum) on its surface which faces the paper substrate.

Carton 31 was loaded with about eighty-five (85) grams of potato strips arranged in side-by-side abutting relation in three (3) layers. The potato strips were about one-quarter (1/4) inch (about 6.4 mm) square in cross section, and up to about three-and-seven-sixteenths (3 and 7/16) inches (about 8.7 cm) in length. The potato strips were selectively repackaged from commercial packages identified as Simplot Bake-A-Fry, Shoestring Frozen Potatoes; a product of J. R. Simplot Company, Boise, Idaho. It is believed that the potato strips were parfried; possibly as disclosed in U. S. Patent 4,590,080 which issued May 20, 1986 to Richard K. Pinegar, and which is assigned to Simplot. It is, however, not intended to thereby limit the scope of the present invention to potato strips in general, or parfried potato strips in particular.

In addition to the three layers of potato strips, two susceptor panels 32 were placed between the layers in carton 31. Carton 31 was then closed and sealed by adhesive. This completed the preparation of package 30. Notably, the sizes of the carton, the susceptor panels, and the potato strips were interrelated to provide a snug fit so that each potato strip had two oppositely facing surfaces in snug contacting relation with surface areas of the susceptor panels.

Package 30 was then placed, vented but unopened, in the Figure 4 orientation (with its back wall 44 facing upward) in a Dual Wave II microwave oven manufactured by the General Electric Company, and having a nominal power rating of about 625 watts. The oven was set to its high power level, and turned ON for one-hundred-twenty-five (125) seconds. Package 30 was then immediately removed from the oven, and opened to the configuration shown in Figure 4; the intermediate-elevation microwave susceptors 32 were removed; and the sides of the carton squeezed to effect the configuration of Figure 5.

Objectively, the weight of the potato strips was reduced from about eighty-five (85) to about seventy-one-and-eight-tenths (71.8) grams: presumably primarily due to moisture loss. Subjectively, the potato strips were substantially uniformly crisp and browned on their outer surfaces; and their masses were moist and meaty like deep fried french fries. By comparison, similar packages which had no susceptor panels, produced soggy, unbrowned potato strips when microwaved for the same time; produced uniformly tough potato strips when microwaved for one-hundred-eighty (180) seconds in an extended effort to achieve doneness in the absence of the microwave susceptor panels; and, when microwaved for two-hundred-forty (240) seconds, produced french fries which were crisp and hard throughout. In the absence of the susceptor panels, no period of time was discovered that produced the combination of a crisp outer surface with a meaty interior mass as provided by the present invention. Additionally, a similar package having susceptor panels 36 and 56, but not having the intermediate-elevation microwave susceptor panels 32, was heated for one-hundred-twenty-five (125) seconds at the same power and in the same oven identified above. The total weight of the potato strips was reduced from about eighty-five (85) to about seventy-two-point-two (72.2) grams. Subjective examination of the potato strips revealed that the layers were not uniformly done; and that the strips were not uniformly crisp and brown on their outsides, or meaty in their interiors.

ALTERNATE EMBODIMENTS

Package 130, Figure 7, is a perspective view of an alternate embodiment of the present invention which comprises a carton 131, and

three (3) layers of food pieces 33 such as potato strips. A portion of a top microwave susceptor panel 136 is visible through a hole torn in the top wall 135 of carton 131 which hole is defined by edge 137a; and some food pieces 33 are visible through a hole torn in top microwave susceptor panel 136, which hole is defined by edge 137b. Additionally, through a hole torn in side wall 146 which hole is defined by edge 148, two intermediate-elevation microwave susceptor panels 132 are visibly disposed between the layers of food pieces 33; and a bottom microwave susceptor panel 156 is disposed between the bottom layer of food pieces 33 and the upward facing surface of the bottom wall 143 of the carton. Front flap 138 and front wall 145 are also identified in Figure 7.

Top wall 135, Figure 7, is subdivided by lines of weakening 141a-141c, and hinge score lines 142a and 142b to provide hinged panels 135a and 135b upon opening of carton 131 as described below. Additionally, side wall 146 of carton 131, Figure 7, is subdivided by lines of weakening 149a-149d to define corner support panels 146a and 146e, vent panels 146b and 146d, and strap panel 146c, the functions of which are described below.

Referring now to Figure 8, package 130 is oriented with its top wall 135 facing forward, and its side flap 146 at the top of the figure. The configuration and orientation shown in Figure 8 is the preferred configuration and orientation for placement of package 130 in a microwave oven for heating/cooking of the food pieces. Vent panels 146b and 146d are open, and extend upwardly to enable the escape of volatiles during microwave heating. Strap panel 146c is in its closed position to strap edge portions of the top wall 135 and the bottom wall of the carton together. Thus, strap panel 146c functions to maintain a snug contacting relation between the microwave susceptor elements of the carton and the adjacent surfaces of the food pieces 33 during microwave heating/cooking. As stated above, this snug contacting relation between microwave susceptor panels and adjacent surfaces of food pieces is to effect or ensure crispening and possibly browning of the outer portions of the food pieces.

Package 130, Figure 7, comprises dual or duplex means for being opened to provide access to remove the food pieces 33 therefrom.

Such access is referred to as eating access. One mode of eating access is provided as shown in Figure 9. Figure 9 is a fragmentary perspective view of the top portion of package 130 after strap panel 146c has been opened to provide end-on eating access to the food pieces 33 disposed in the package. Also, one intermediate-elevation microwave susceptor panel 132 is partially removed from package 130 to further facilitate such end-on eating access. Preferably, both intermediate-elevation susceptor panels 132 are removed to best facilitate end-on eating access of food pieces 33 through the opening provided by opening panels 146b-146d of carton 131.

A second mode of eating access for the contents of package 130 is provided by carton 131, shown in perspective in Figure 10 and referred to as layer-by-layer eating access. In Figure 10, panels 135a and 135b have been opened, the opening being enabled by rupturing the lines of weakening 141a-141c, Figure 7, as described above. Some of the food pieces 33 comprising the top layer have been removed as evidenced by a visible portion of intermediate-elevation microwave susceptor panel 132. That panel 132 will, of course, be removed upon exhaustion of the top layer of food, to provide access to the second layer, and so forth.

Figure 11 is a plan view of a carton blank 131b which can be erected to form carton 131, Figures 7-10. The top microwave susceptor panel 136 and the bottom microwave susceptor panel 156, Figure 7, are not included in Figure 11 because they are not portions of the blank per se. This is, however, not intended to preclude having microwave susceptor material applied to the blank (e.g., cartonboard) as discussed above as an alternative to attaching discrete microwave susceptor panels to the top and bottom walls of the carton blank.

An alternate embodiment, intermediate-elevation microwave susceptor panel 232 is shown in the plan view of Figure 12, and the fragmentary sectional view of Figure 13 which is taken along section line 13-13, Figure 12. Panel 232 has a double sided, corrugated configuration which provides means for effecting uniform lateral spacing between elongate articles disposed in microwave food packages as described above. Such spacing may be provided to enable more ready escape of volatiles from the articles during microwave heating.

Panel 232, Figure 12, comprises a pull-tab 263 which remains cool during microwave heating by virtue of not being coated or covered with microwave susceptor material, edge 264 being the edge of the microwave susceptor portion of panel 232.

Alternate intermediate-elevation microwave susceptor panel 232 is shown in Figure 13 to comprises a planar sheet 281, and two corrugated sheets 282 and 283. Microwave susceptor materials, not shown, may be incorporated in any one or more of the sheets: for example, by laminating a vapor deposited aluminum coated thermoplastic film to a paper substrate to form a sheet before the several sheets are combined in a corrugator.

Figure 14 is a plan view of a duplex intermediate-elevation microwave susceptor panel 332 which may be used, for example, in place of the two discrete intermediate-elevation microwave susceptor panels 132 in package 130, Figure 7. Duplex panel 332 comprises panels 332a, 332b, and 363 which are demarked from each other by edges 364a and 364b: the edges of microwave susceptor layers of panels 332a and 332b. Panel 363 is as wide as the thickness of the intermediate layer of articles 33, Figure 7; is not coated with microwave susceptor material; and is configured to provide a cool pull-tab as described above.

Figure 15 is a perspective view, similar to Figure 9, of an alternate embodiment microwave food package 230 which comprises a duplex intermediate-elevation microwave susceptor panel 332, Figure 14. In Figure 15, package 230 has been opened to provide end-on eating access; side panel portions 146b-d extend upward; and duplex panel 332 is partially removed.

In addition to the embodiments of the invention described above, two additional alternate embodiments and features thereof are shown in Figures 16-26, and described below. These alternate embodiments comprise cartons which are characterized by layer divider panels which are integral portions of their respective carton blanks: one such alternate being disclosed in Figures 16-23, inclusive; and the second in Figures 24-26, inclusive. These alternate embodiments are also characterized by duplex opening features as described above: end-on eating access or top eating access by manipulating the panels of the cartons as described above in conjunction with describing

package 130. Parenthetically, in most of the views, the microwave susceptor elements, panels and surfaces are not shown in order to more clearly show the other elements of the cartons and packages. Suffice it to say that these cartons and packages do comprise microwave susceptor materials on their top, bottom and layer divider walls and panels so that each article 33 disposed therein is snugly sandwiched between two microwave susceptor bearing walls and/or panels to provide the crispening and browning of each article 33 as described above.

Referring now to Figure 16, an alternate embodiment carton blank 431b is shown in plan view to comprise top wall 435, bottom wall 443, back wall 444, front wall 445, side walls 446 and 447, spacer panels 490 and 491, and integral layer divider panels 432a and 432b. The top wall 435 is subdivided by lines of weakening 441a-441c, and score lines 442a and 442b to defined hinged panels 435a and 435b. Side walls 446 and 447 are subdivided by lines of weakening to define vent panels 446b and 446d, and 447b and 447d, respectively; and strap panels 446c and 447c, respectively, for the purposes described above with respect to corresponding elements of carton 131. Spacer 490 has a height equal to the combined heights of two layers of articles to be packaged in a carton made from blank 431b; and spacer 491 has a height equal to the height of one layer of articles.

Figure 17 is a sectional view of a carton 431 which is formed by erecting a carton blank 431b, Figure 16, and is taken along a section line corresponding to section line 17-17 indicated on Figure 16. This view shows the relative positions of the integral layer divider panels 432a and 432b as they would be positioned in the presence of three layers of articles such as articles 33 described above.

Figure 18 is a perspective view of carton 431, Figure 17, prior to its being filled and sealed. Figures 19 through 23 depict the sequence of loading three layers of articles 33 into carton 431, and of folding the concatenated series of panels 490, 432a, 491, and 432b so that the panels are positioned as indicated in Figure 17. In Figure 23, the loaded carton 431 is identified as package 430; an alternate embodiment of the invention.

Carton blank 531b, Figure 24, is, briefly, a second alternate carton blank having integral layer divider panels as described above.

Carton blank 531 is preferably provided with microwave susceptor materials, not shown, on its top and bottom walls as described above in conjunction with carton 130, and its integral layer divider panels in the same manner prior to its being erected to have the cross sectional configuration shown in Figure 25; and may be loaded, and subsequently opened as indicated in Figure 26.

Referring back to Figure 24, carton blank 531b comprises top wall 535, bottom panel 543, back wall 544, front wall 545, side walls 546 and 547, and a concatenated series of panels which include spacer panel 490, a first integral layer divider panel 532a, spacer panel 591, a second integral layer divider panel 532b, and a distal flap panel 592. Element by element, and feature by feature, the elements and features of carton blank 531b which correspond to those of carton blank 431b are identically designated but for the designators for blank 431b being in the 400 series, and the designators of blank 531b being in the 500 series. Accordingly, carton blank 531b is erected, vented, and opened in the general manner described above with respect to carton blank 431b. However, the integral layer divider panels 532a and 532b of carton blank 531b are subdivided by lines of weakening and score lines as indicated so that they can be hinged open to provide layer-by-layer eating access to the lower layers of articles packaged therein. More specifically, the first integral layer divider panel 532a is subdivided into panels 532aa and 532ab by lines of weakening 594a-594c, and hinge score lines 595a and 595b; and the second integral layer divider panel is subdivided into panels 532ba and 532bb by lines of weakening 596a-596c, and hinge score lines 597a and 597b. Of course, such layer-by-layer eating access means can also be incorporated in carton blank 431b albeit not so indicated in the figures.

Figure 25 is a cross sectional view of carton 531 taken along a section line corresponding to section line 25-25, Figure 24. Carton 531 is formed by erecting carton blank 531b, Figure 24, so that the panels and walls are positioned as shown in Figure 25. Surface portions of panels 590, 591, and 592 which face portions of walls 544 and 545 may be adhesively bonded together albeit it is not intended to thereby limit the scope of the present invention. Carton 531 is

loaded with 3 layers of articles, and closed to form package 530, Figure 26.

Package 530, Figure 26, is shown after being opened by hinging back top panels 535a and 535b; and after having the top layer of articles removed, and providing access to the second layer of articles 33 by hinging back panel portions 532ba and 532bb of the top integral layer divider panel as shown. Additionally, wall portions 546b and 546d are shown in their open positions: the positions they would have been in to enable venting of the package during microwave heating as described above in conjunction with the other embodiments of the invention.

Designator 536b, Figure 26, identifies a portion of a microwave susceptor panel which corresponds to panel 136a of carton 131, Figure 10. The other microwave susceptor elements of the carton 531 which were referred to above are not shown in Figure 26. Suffice it to say, as stated above, carton 531 does comprise microwave susceptor materials on its walls and panels so that each article 33 disposed therein is snugly sandwiched between two microwave susceptor bearing walls and/or panels to provide the crispening and browning of each article 33 as described above. The same is true with respect to carton 431, Figures 17-23, wherein the microwave elements or surfaces were not shown in order to more clearly show the other elements of the carton.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed is:

1. A package for use in microwave heating oppositely facing surfaces of each of a plurality of food pieces which food pieces are disposed in at least two layers within said package, said package comprising:

(a) enclosure means;

(b) a top microwave susceptor;

(c) an intermediate-elevation microwave susceptor disposed between each two adjacent layers of said food pieces; and

(d) a bottom microwave susceptor, said susceptors being sized and configured to heat facing surfaces of said articles disposed in the layers adjacent thereto.

2. The package of Claim 1 wherein said food pieces are uniformly thick and have substantially planar, oppositely facing surfaces, and wherein said enclosure and said susceptors are so sized and configured with respect to said food pieces that said food pieces fit snugly between said susceptors and with said planar surfaces in contacting relation with surface portions of said susceptors.

3. The package of Claim 2 wherein said food pieces are elongate, and are disposed in substantially parallel relation.

4. The package of Claim 3 further comprising means for providing side-to-side spacing between adjacent said articles in each said layer of articles.

5. The package of Claim 1, 2, 3, or 4 wherein said food pieces are potato strips.

6. The package of Claim 5 wherein said potato strips have been parfried prior to being packaged.

7. The package of Claim 1, 2, 3, or 4 wherein said food pieces are reconstituted potato strips.

8. The package of Claim 1 further comprising means for venting said enclosure while said package is subjected to microwave energy.

9. The package of Claim 1 further comprising means for opening said enclosure to convert it into a serving receptacle.

10. The package of Claim 1 comprising duplex opening means whereby a user may optionally open said package to provide either end-on access to said food pieces, or layer-by-layer access to said food pieces.

11. The package of Claim 1 wherein said enclosure means is of unitary construction, and each said intermediate microwave susceptor panel comprises an integral portion of said enclosure means having microwave susceptor material disposed thereon.

12. A package for use in microwave heating two oppositely facing surfaces of each of a plurality of articles which articles are disposed in at least two layers within said package, said package comprising:

(a) enclosure means comprising a top panel, and a bottom panel, said enclosure being sized relative to the thicknesses of said articles to provide a contacting relation between juxtaposed surfaces of microwave susceptors and adjacent said articles;

(b) a top microwave susceptor which is configured and disposed to heat upwardly facing surface areas of said articles which are disposed in the layer of said articles that is disposed immediately subjacent said top panel;

(c) an intermediate-elevation microwave susceptor which is disposed between each two of said layers which are in over and under juxtaposition, said intermediate-elevation microwave susceptor being configured and disposed to heat upwardly facing surface areas of said articles which are disposed in a layer of said articles which is disposed immediately under said intermediate-elevation susceptor, and to heat downwardly facing areas of said articles which are disposed in a layer of said articles which is disposed immediately above said intermediate-elevation susceptor;

(d) a bottom microwave susceptor which is configured and disposed to heat downwardly facing surface areas of said articles which are disposed in a layer of said articles which is disposed immediately superjacent said bottom panel;

(e) means for venting said enclosure to enable the escape of volatiles emitted from said articles when said package is heated in a microwave oven; and

(f) means for opening said enclosure to enable removal of said articles upon completion of their being heated in said microwave oven whereby said enclosure becomes a serving receptacle.

13. A packaged food product comprising a container, and a plurality of food pieces having generally planar top and bottom surfaces, and uniform thicknesses, which food pieces are disposed in a predetermined array comprising plural, substantially like layers, said container comprising:

(a) enclosure means comprising a top panel, and a bottom panel, said enclosure being sized relative to the thicknesses of said food pieces to provide a contacting relation between juxtaposed surfaces of microwave susceptors and adjacent said food pieces;

(b) a top microwave susceptor which is configured and disposed to heat upwardly facing surface areas of said food pieces which are disposed in a layer of said food pieces that is disposed immediately subjacent said top panel;

(c) an intermediate-elevation microwave susceptor which is disposed between each two of said layers which are in over and under juxtaposition, said intermediate-elevation microwave susceptor being configured and disposed to heat upwardly facing surface areas of said articles which are disposed in a layer of said articles that is disposed immediately under said intermediate-elevation susceptor, and to heat downwardly facing areas of said articles which are disposed in a layer of said food pieces which is immediately above said intermediate-elevation susceptor;

(d) a bottom microwave susceptor which is configured and disposed to heat downwardly facing surface areas of said food pieces which are disposed in a layer of said food pieces which food pieces disposed immediately superjacent said bottom panel;

(e) means for venting said enclosure to enable the escape of volatiles emitted from said food pieces when said package is heated in a microwave oven; and

(f) means for opening said enclosure to enable removal of said food pieces upon completion of their being heated in said microwave oven whereby said enclosure becomes a serving receptacle.

14. The packaged food product of Claim 12 or 13 wherein one or more of said susceptors comprise integral portions of said enclosure having microwave susceptor material disposed thereon.

15. The packaged food product of Claim 1, 12, or 13 wherein said layers number two.

16. The packaged food product of Claim 1, 12, or 13 wherein said layers number three, and wherein there are two said intermediate-elevation susceptors.

17. The packaged food product of Claim 16 further comprising means for simultaneously removing said intermediate-elevation susceptors upon opening said enclosure.

18. The packaged food product of Claim 16 wherein said two intermediate-elevation susceptors are integrated into a unitary element.

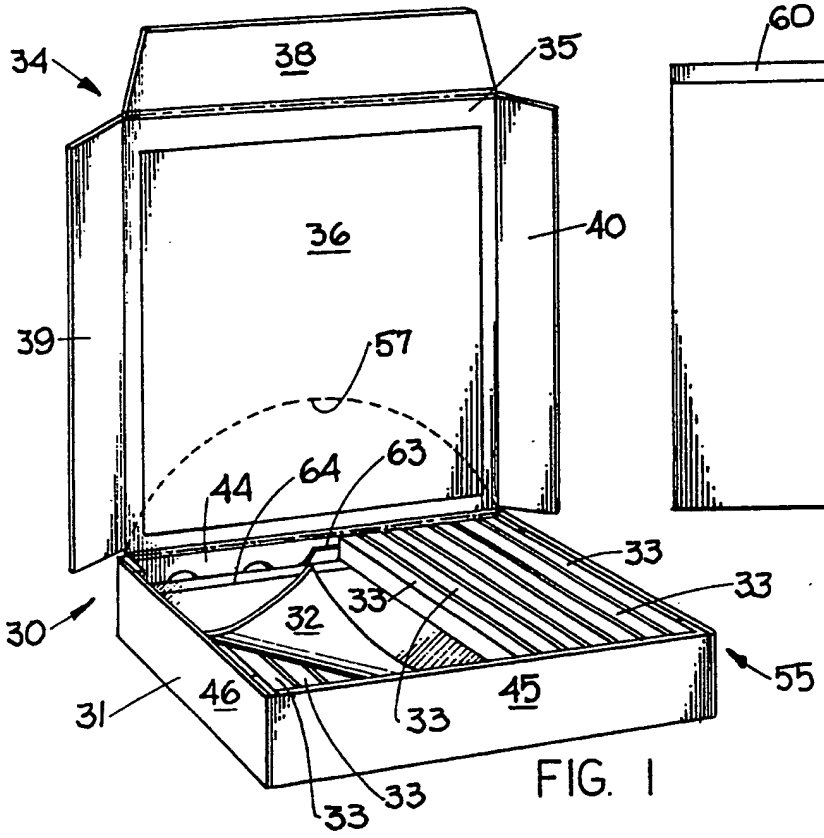


FIG. 1

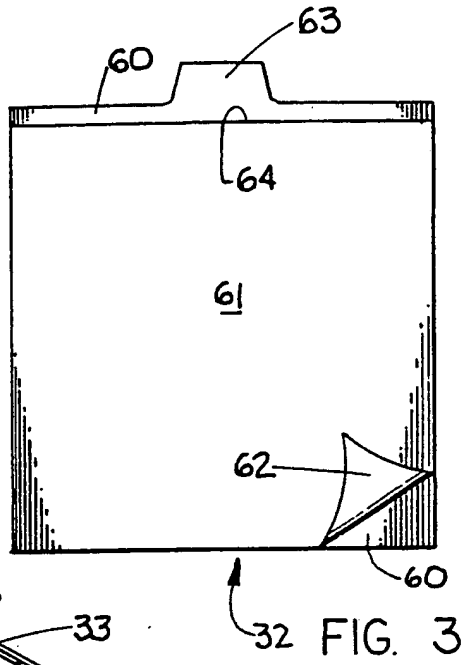


FIG. 3

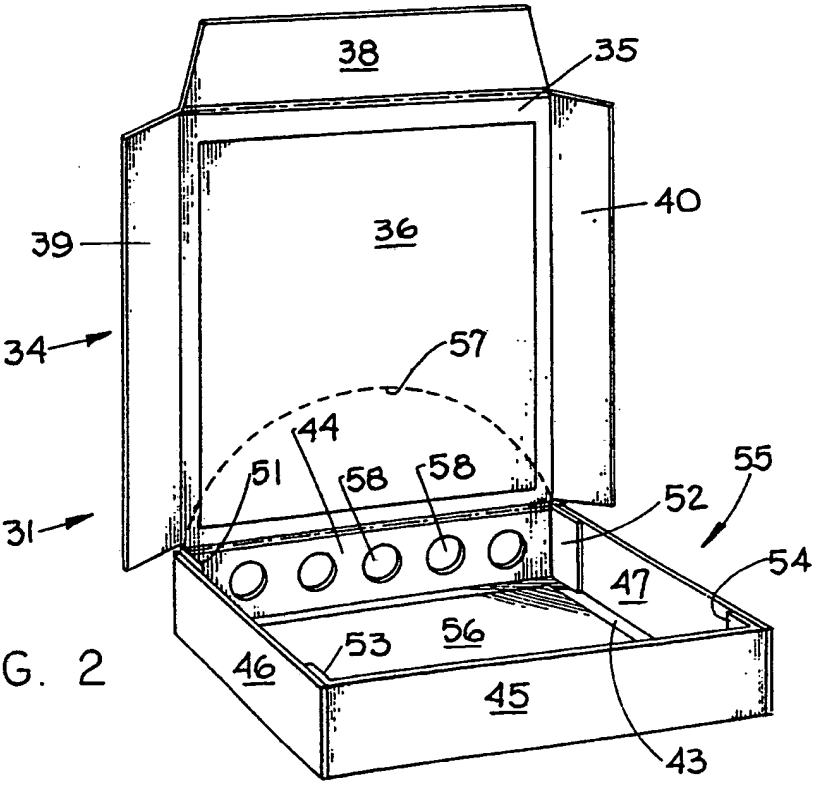


FIG. 2

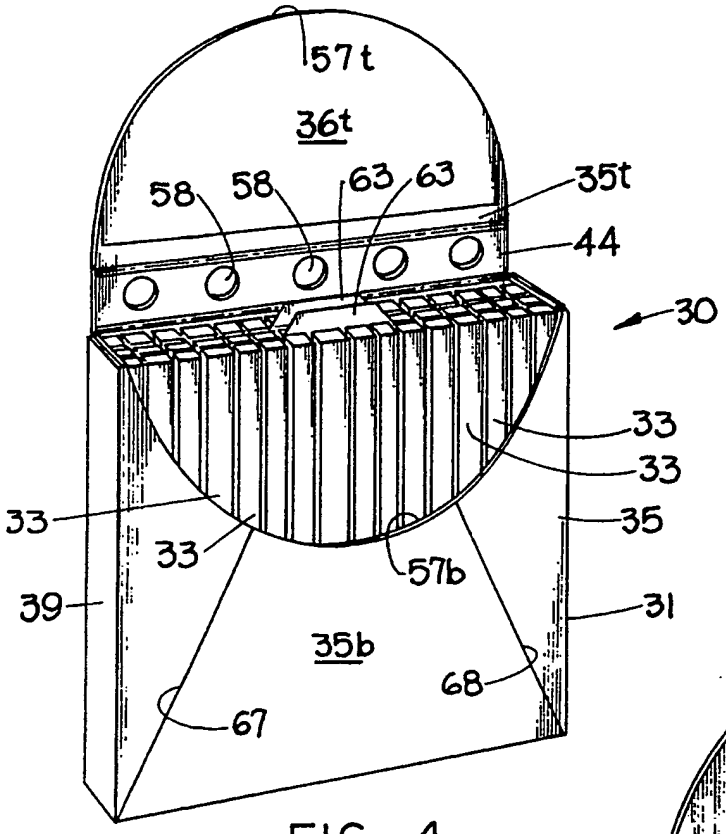
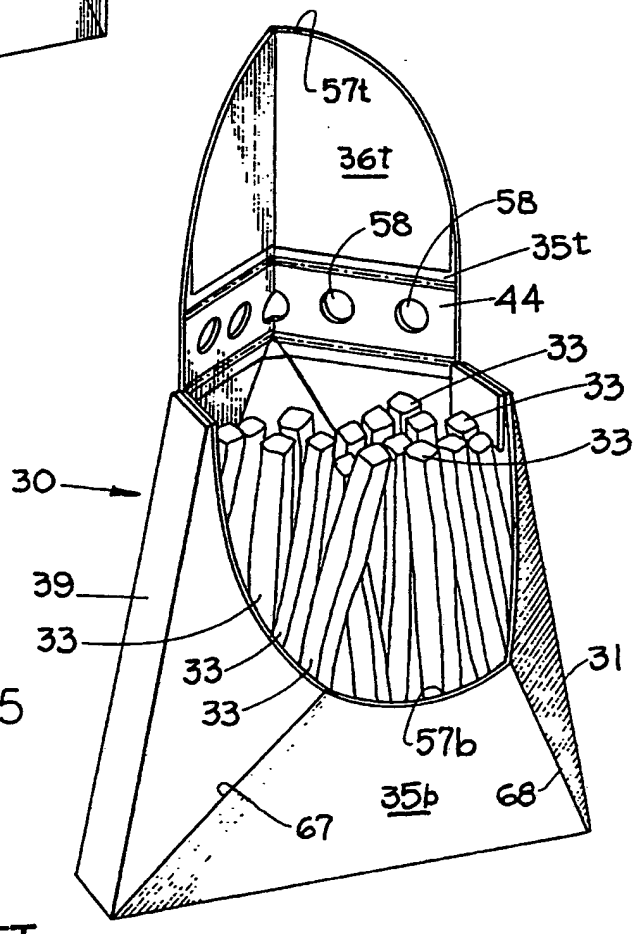

57t
36t
58
58
63
63
35t
44
30
33
33
33
33
35
57b
39
31
35b
68
67

FIG. 4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36t
58
58
35t
44
33
33
33
30
39
33
33
33
31
57b
35b
68
67

FIG. 5

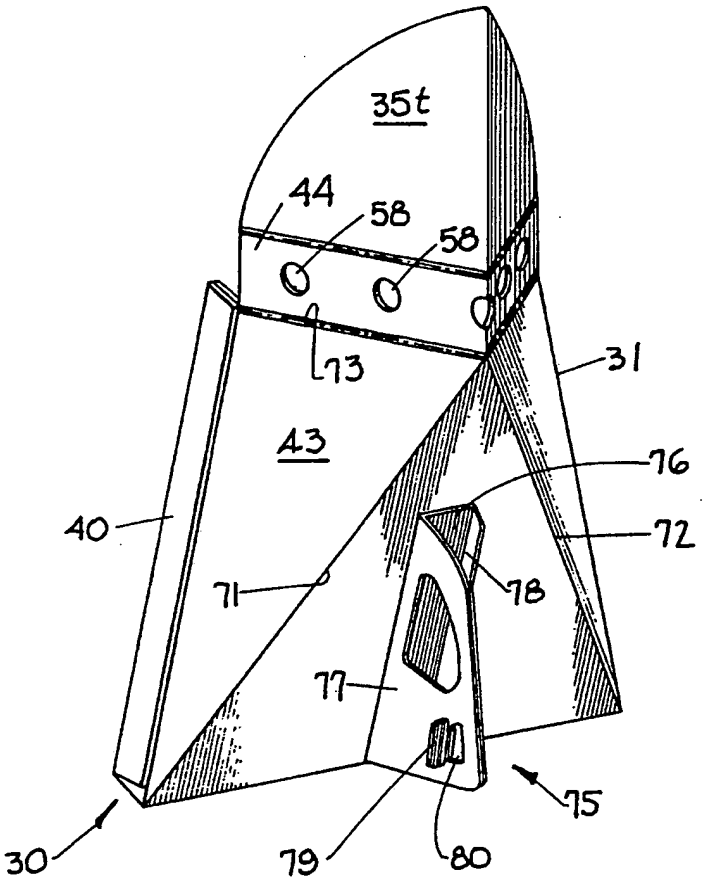
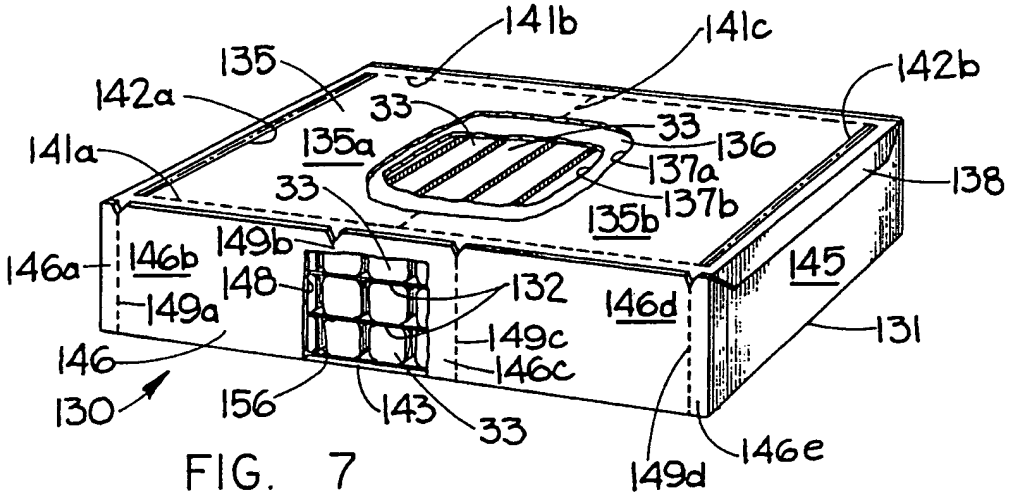


FIG. 6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142b
142a
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141a
135a
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137a
138
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135b
137b
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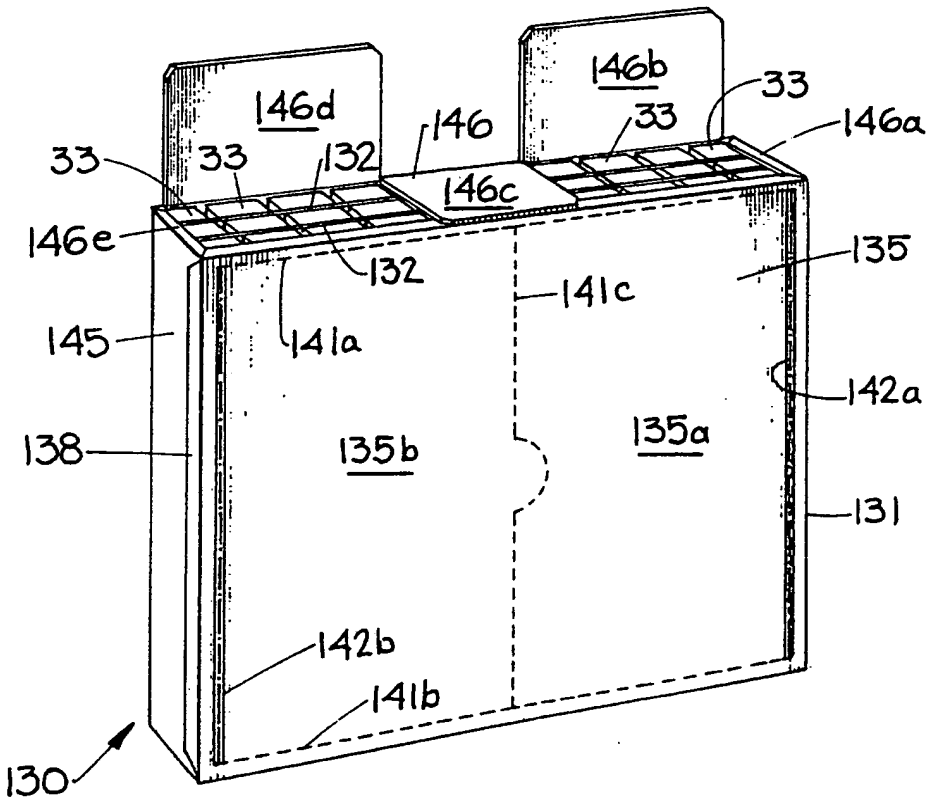
146b
149b
145
148
132
146d
149a
149c
131
146
146c
130
156
143
33
146e
149d

FIG. 7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146
33
146a
33
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146c
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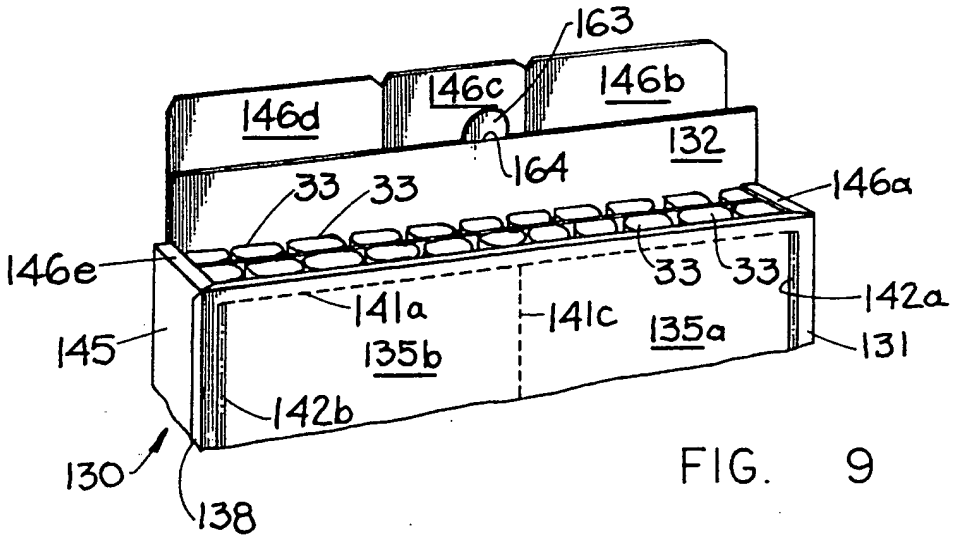
135b
135a
131
142b
141b
130

FIG. 8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146c
146b
146d
132
164
33
33
146a
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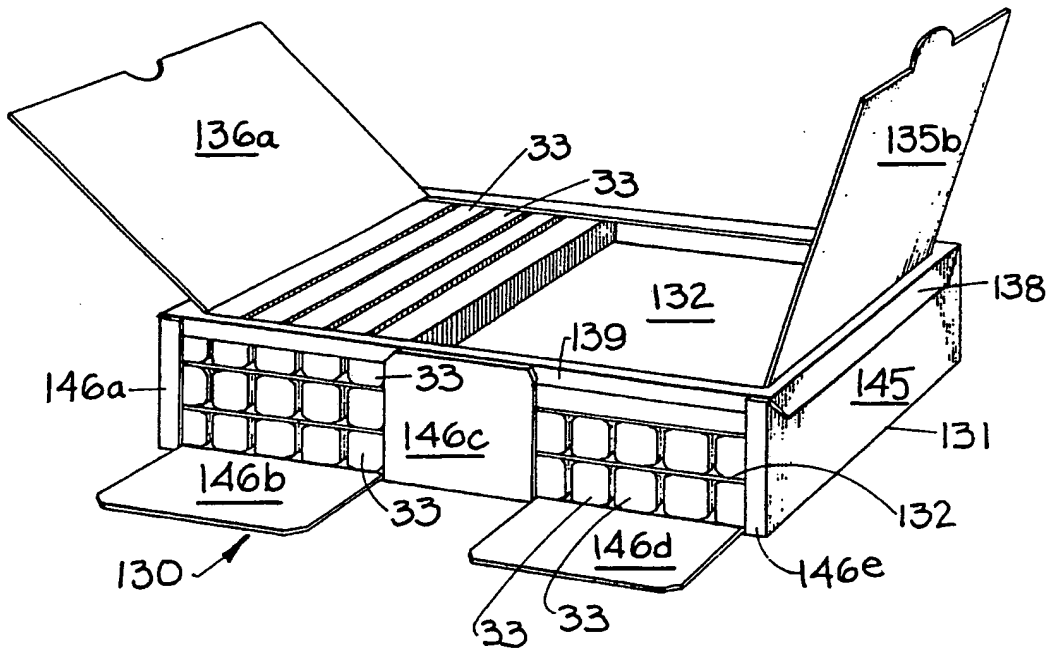
141a
141c
135a
145
135b
131
142b
130
138

FIG. 9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33
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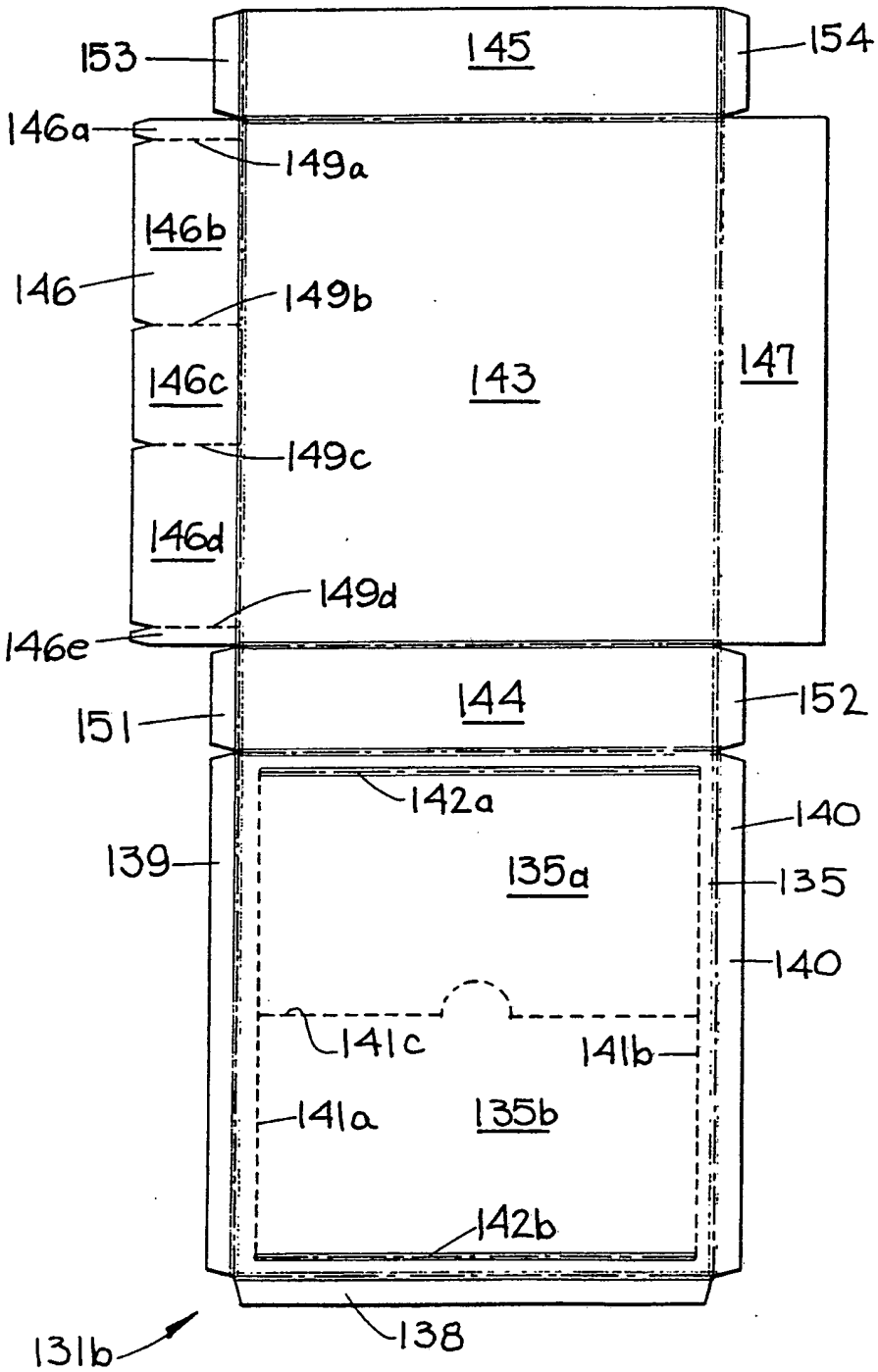
146e
33
33

FIG. 10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145
154
146a
149a
146b
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149b
146c
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149c
146d
149d
146e
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142b
131b
138

FIG. 11

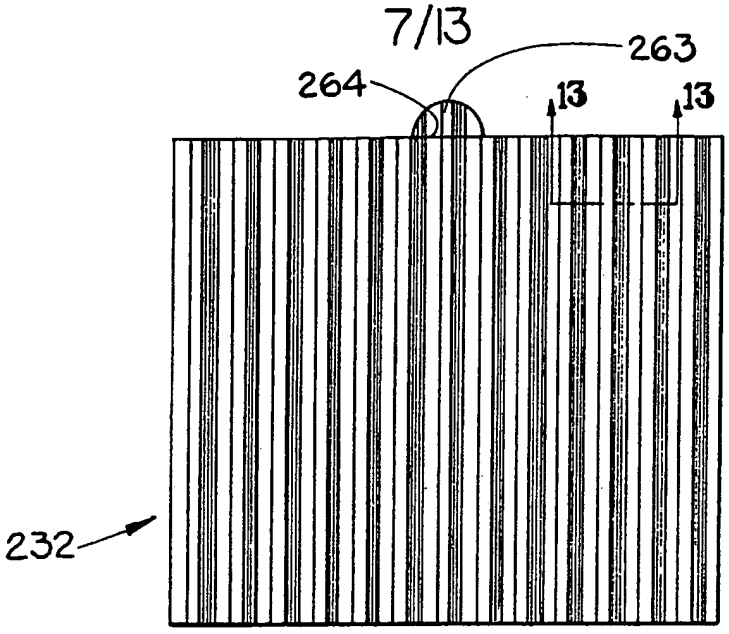


FIG. 12

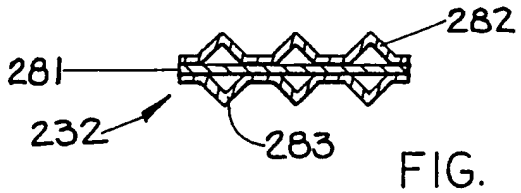


FIG. 13

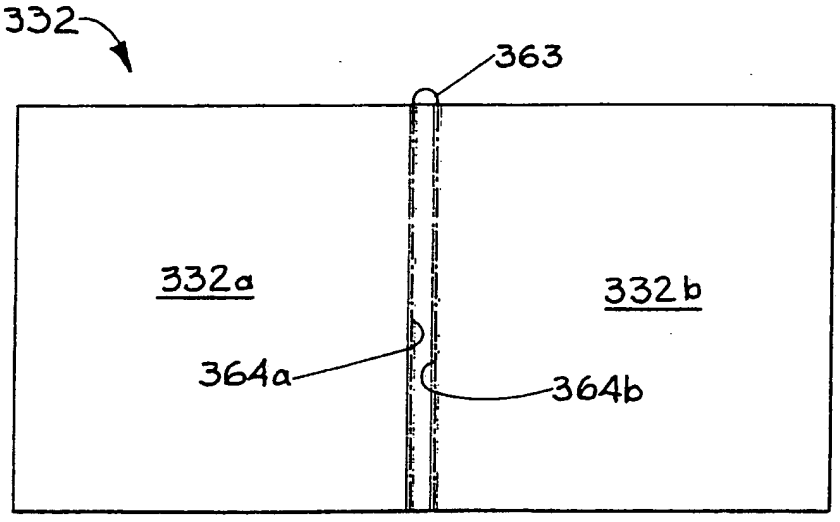
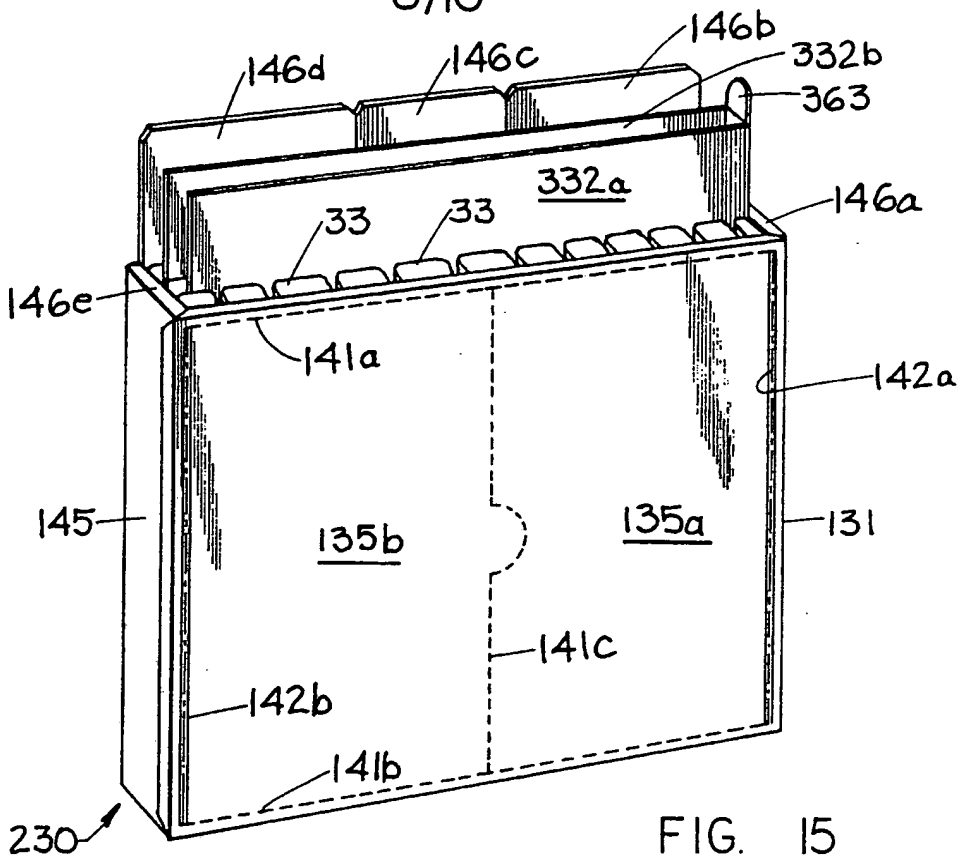


FIG. 14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146d
146c
332b
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146a
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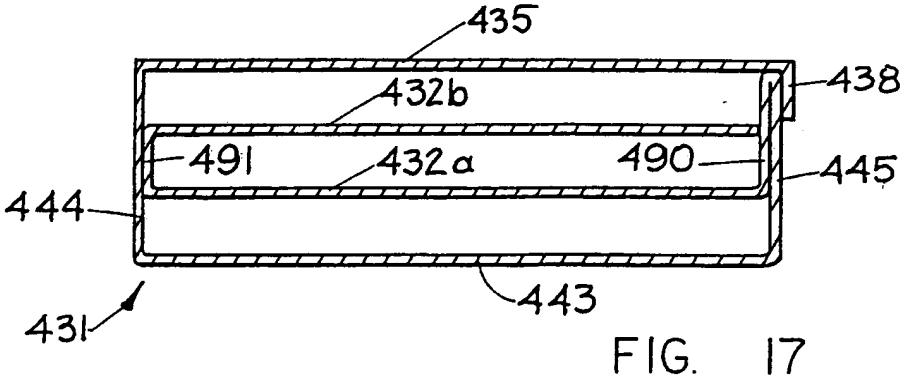
33
146e
141a
142a
145
135b
135a
131
141c
142b
141b
230

FIG. 15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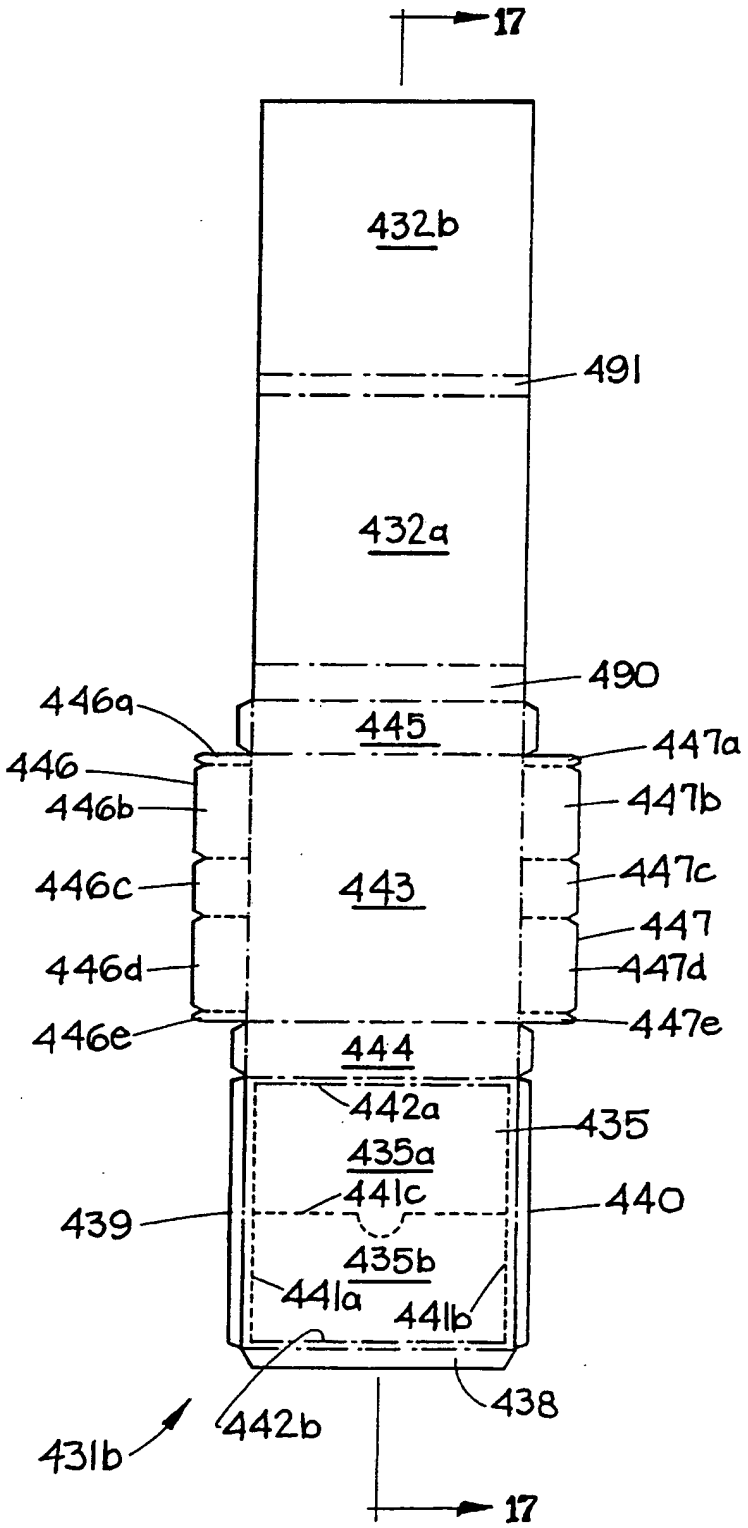
438
432b
491
432a
490
445
444
443
431

FIG. 17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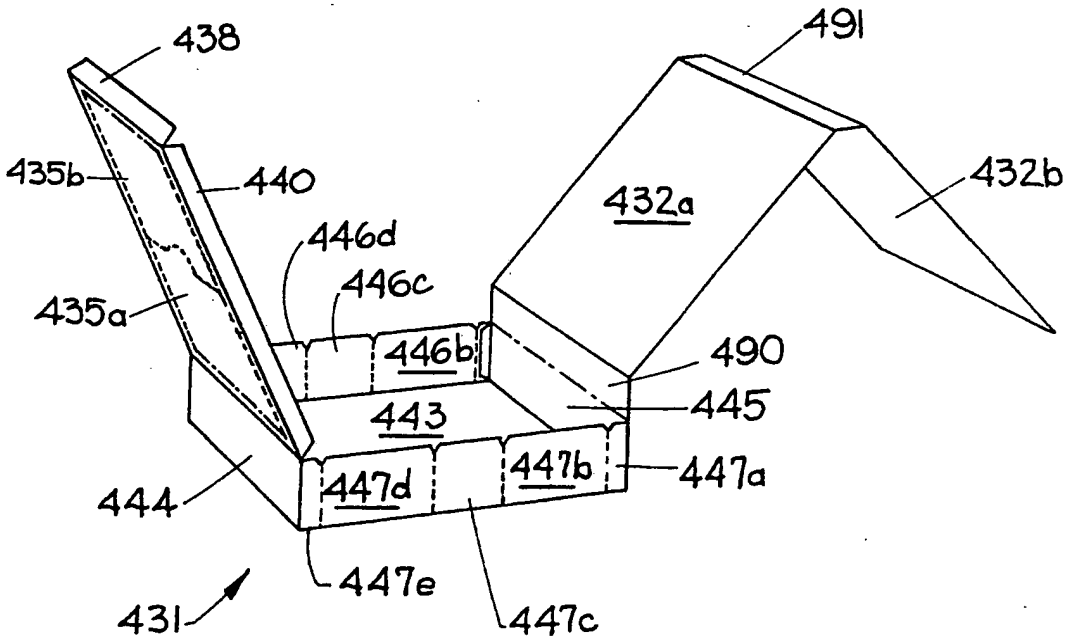
432b
491
432a
490
446a
445
447a
446
446b
447b
446c
443
447c
447
446d
447d
446e
447e
444
442a
435
435a
441c
439
440
435b
441a
441b
438
431b
442b
17

FIG. 16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491
435b
440
432a
432b
446d
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446b
490
443
445
447d
447b
447a
444
447e
431
447c

FIG. 18

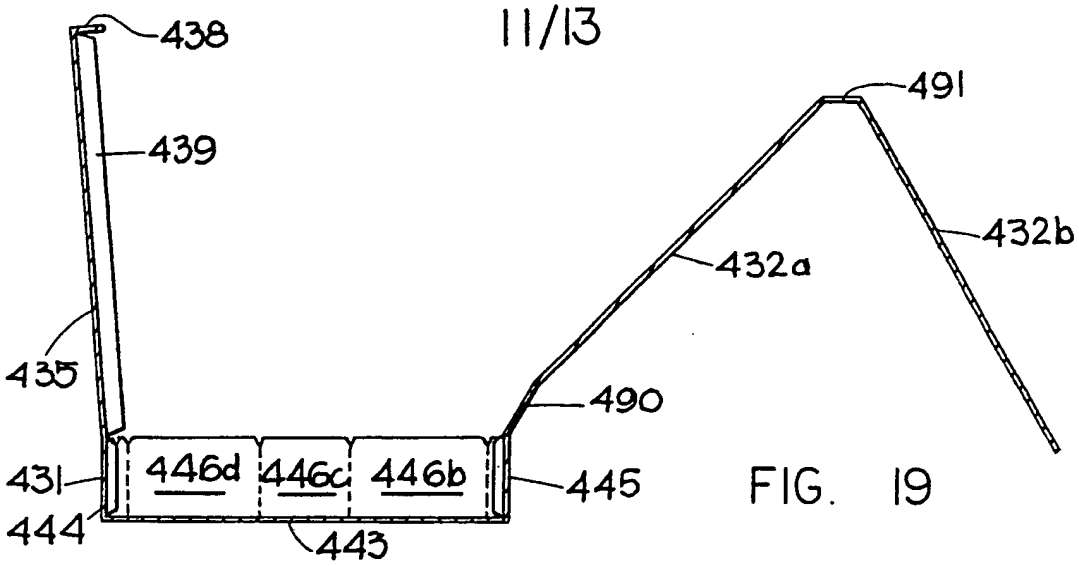


FIG. 19

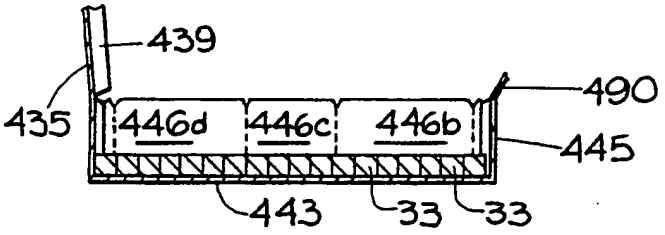


FIG. 20

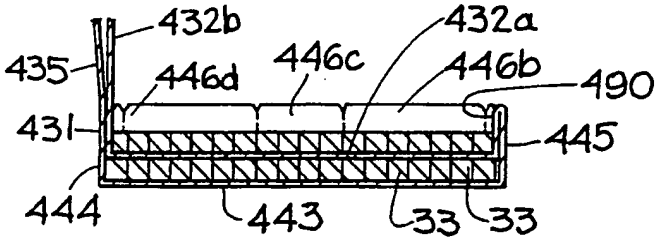


FIG. 21

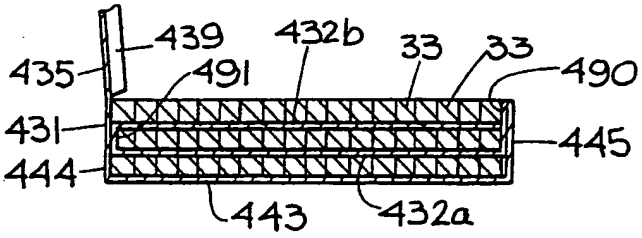


FIG. 22

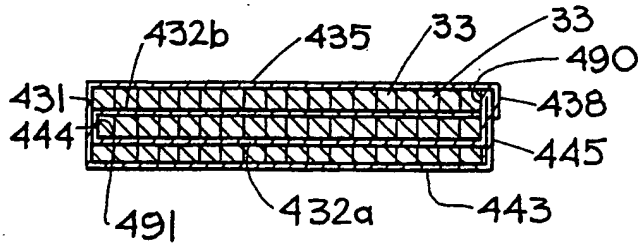
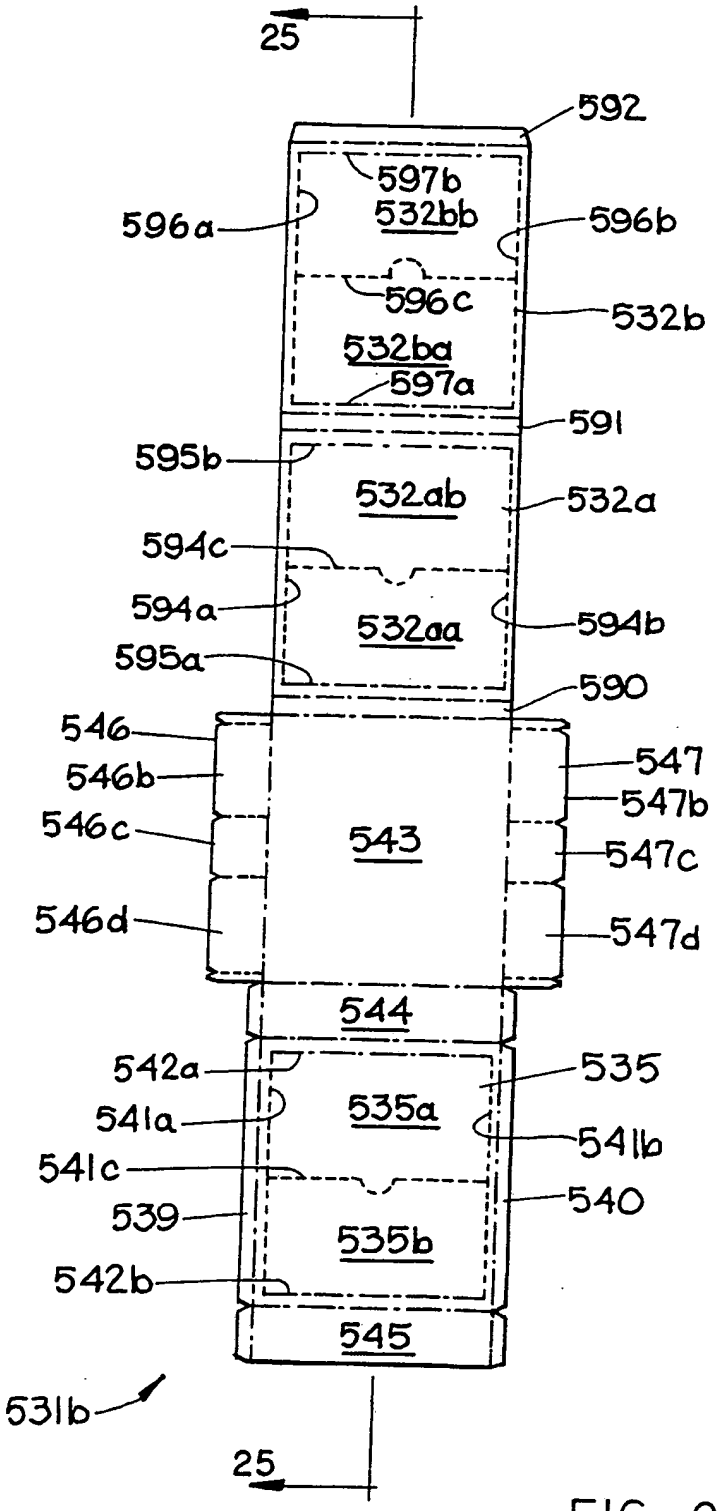


FIG. 23


25
592
597b
596a
532bb
596b
596c
532b
532ba
597a
591
595b
532ab
532a
594c
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594b
595a
590
546
547
546b
547b
546c
543
547c
546d
547d
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541c
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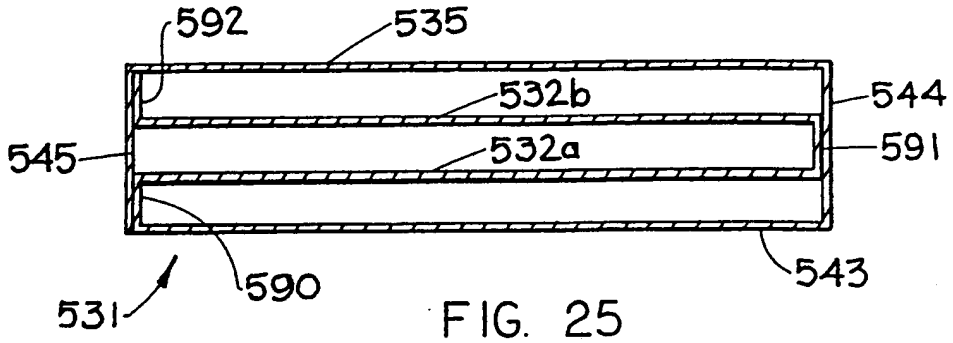
535b
542b
545
531b
25

FIG. 24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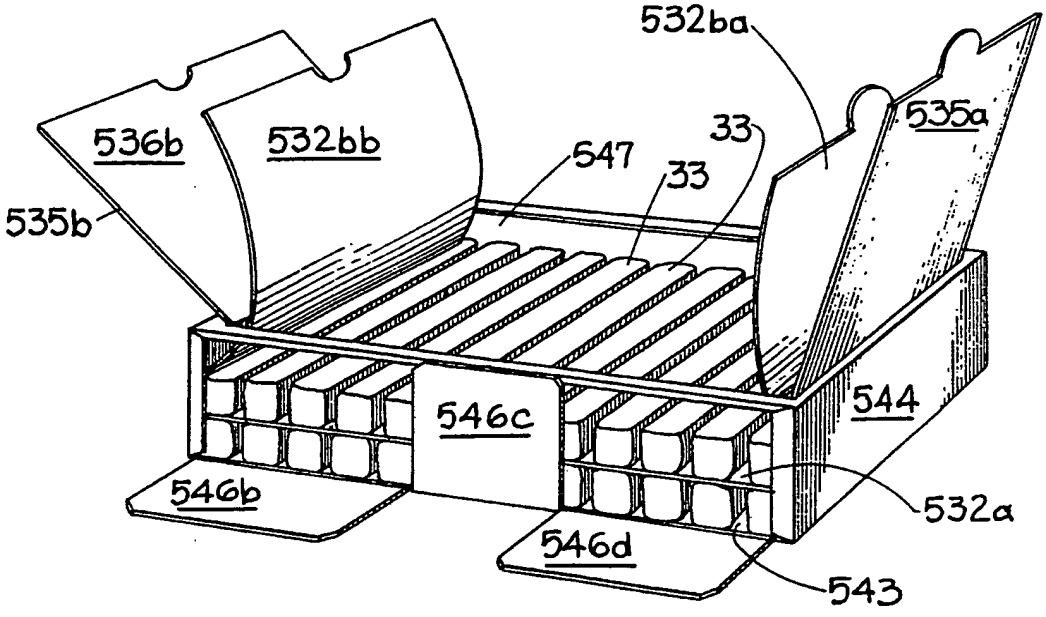
543
531

FIG. 25


532ba
536b
532bb
547
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33
535a
535b
544
546c
546b
532a
546d
543

FIG. 26

INTERNATIONAL SEARCH REPORT

International Application No PCT/US90/06889

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC(5): B65D 85/00; H05B 6/64
U.S. Cl. 426/107; 219/10.55E

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	426/107,234,243; 219/10.55E

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X Y	US,A 4,943,439 (Andreas et al) 24 July 1990, see column 2, lines 5-68; column 5, lines 10-13; column 6, lines 3-18 and 66-68; column 7, lines 1-5.	1-5,7-14,16-18 6, 15
Y	US, A, 4,590,080 (Pinegar) 20 May 1986, see column 1, lines 9-47; column 2, lines 25-41.	6

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [3]
19 February 1991	22 APR 1991
International Searching Authority [1]	**Signature of Authorized Officer** [20]
ISA/US	for Andrea Robinson Tony Weier

Form PCT/ISA/210 (second sheet) (May 1986)